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Township Engineer

Creating Safer Neighborhoods Through Greener Road Design

Part 2 of a two-part series

BY RANDALL ARENDT / SENIOR CONSERVATION ADVISER, NATURAL LANDS TRUST

The previous edition of *Township Engineer* looked at three of six elements of greener road design. Narrower streets, sidewalks, and canopy shade trees each offer environmental benefits, improve safety in residential neighborhoods, and have the potential to save townships money.

This issue will consider the remaining three elements of green road design for neighborhoods: natural stormwater control methods, better cul-de-sac design, and safer curves.

Controlling stormwater naturally

Conservation designers generally favor open drainage swales for stormwater control, rather than curbs and gutters, except where lots are smaller, ranging from 6,000 to 12,000 square feet. While curbs channel all stormwater into pipes and detention basins, vegetated swales allow part of the stormwater to infiltrate into the ground. Such natural stormwater control could be increased by including rain gardens at various points along the street, such as in every four to six lots. Rain gardens are shallow depressions that are landscaped with moisture-tolerant trees and flowers. As water collects in the depression, the plants remove contaminants before the water slowly infiltrates into the ground.

Another natural stormwater management technique is requiring downspouts to be connected to French drains located in yards. These are ditches filled with gravel or rock that allow the water to collect and then infiltrate into the ground.

The design flexibility in the *Growing Greener: Conservation by Design* program, developed through a partnership between the state Department of Natural Resources and Conservation and the Delaware County-



Swales can easily serve in place of curbs, even when density is greater than two dwellings per acre.



Infiltration or conservation meadows are a less expensive and environmentally superior alternative to deep “bomb-crater” basin designs. In this example from Doylestown Township in Bucks County, the side slopes are so gentle that the entire meadow can be mowed with large equipment once a year, saving the township money and manpower. It also provides habitat for birds, insects, bats, and other small mammals.



Greener Road Design (cont.)

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FOURTH QUARTER
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based Natural Lands Trust, permits extensive areas to be used for onsite infiltration. Such practices include conservation meadows or infiltration trenches that snake between the larger trees in a woodland setting. Doylestown Township in Bucks County uses the former to control stormwater (see bottom photo on Page 1).

Stormwater management standards in many township ordinances are a bit antiquated, based on the detention basin or impact/bomb crater approach and focusing only on the rate of runoff, rather than on the total volume of runoff after development. Townships should consider adopting a goal of zero increase in runoff volume after development, through various infiltration techniques. A good source of information on this approach can be found at the Web site of the Maryland-based Center for Watershed Protection, which helps municipalities update their stormwater practices. The Web address is www.cwp.org.

Conservation design, which emphasizes compact lot sizes and significant open space, offers many opportunities to disperse stormwater over much broader areas, so that deep, engineered structures with steep sides and spillways are not needed. Not only do natural storm-



Small seasonal ponds can also enhance roadside open space, such as this one located in a modest neighborhood green encircled by a residential street.

water control measures enhance the appearance of subdivisions, such as the seasonal pond pictured above, but they also help recharge groundwater.

Green alternatives to cul-de-sacs

An environmentally friendly alternative to the standard short cul-de-sac is the so-called “court” or “close” design, as shown in the illustration on Page 3. Instead of having a 50-foot wide right of way leading up to a turnaround with a 130-foot outer-edge diameter, the street is designed as two parallel one-way travel lanes, each 16 feet wide, separated by a central bioretention area or planting strip, perhaps 60 feet wide. The lanes and planting strip lay within a 130-foot-wide right of way. Such streets could be limited to 750 feet in length, if desired. The turning radius at the end would be identical to that of a standard cul-de-sac for ease in maneuvering long vehicles.

This street form is essentially a boulevarded cul-de-sac, so it may not require any special waivers from existing ordinances. The boulevard can also be constructed so its surface slopes toward the center, without curbs on the inside edge, to irrigate a central planting area that is a foot or so lower in the middle compared with the street. The median should be planted with canopy shade trees that do well in both wet and dry conditions, such as red maple and sycamore. This kind of bioretention area represents an innovative improvement over current practice, adding grace and beauty as well as utility.

Safer curves

The standards for horizontal curves are another area where townships can make changes to improve safety and reduce the amount of land required. On local access streets, curve radii longer than 100 feet, creat-

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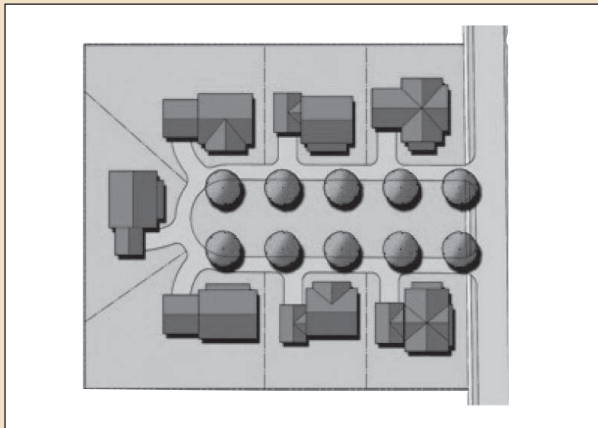
ing more gentle curves, are generally unnecessary and encourage higher travel speeds. Many municipal codes, however, specify a 150-foot minimum curve radius for local streets and 350 feet for collector streets. These are way too long for design speeds of 20 mph for local access streets and 25 to 30 mph for collector streets, as recommended by the American Society of Civil Engineers. That organization suggests 90-foot curve radii for local streets and 165- to 260-foot radii for collectors.

A curve radius of 350 feet creates such a gentle curve that it unwittingly allows speeds of nearly 35 mph through the curve, which means drivers can travel 40 mph on the straight stretches and then slow down only a little as they round the bends. Township officials should ask themselves if they really want to encourage such driving speeds through residential areas. In recent

years, shorter curve radii have become more appreciated for the traffic-calming effects they have in slowing down vehicles traveling through neighborhoods filled with children, pets, and pedestrians. Longer curves also create more impervious surface, increasing stormwater runoff, and cost more to repave because they require more material.

Promoting dialogue

More than any other player in local government, engineers are uniquely positioned to influence the street design policies in their communities. The safety of both motorists and residents in many townships could be measurably improved if consulting engineers were to recommend these ideas to supervisors and planning commission members. ➤



The “court” or “close,” pictured in the sketch and photo above, is essentially a short cul-de-sac with a central boulevard median, greatly expanded in width to serve various functions, from aesthetic enhancement to stormwater management. The central open space is bounded by a one-way circulatory street and provides a green oasis with much room for shade tree planting and a safe place for young residents to play.



When the boulevard model is not feasible, cul-de-sacs should at least include an island planted with canopy shade trees to properly fill the space in the center of this bulbous street form. Existing trees could also be left in place in the center. Plowing snow is much easier in such a design because plow operators can make one efficient sweep around the central island.

REGISTER TODAY!

Township Engineers Association Annual Fall Seminar

Two dates and locations to choose from:

- **October 14** — **Best Western Reading Inn, Shillington, Berks County**
- **October 22** — **Cranberry Township Municipal Building, Butler County**

Sponsored by the Pennsylvania State Association of Township Supervisors and the Pennsylvania State Association of Township Engineers

Tentatively scheduled topics include:

- Gas and oil well drilling — legal and environmental issues; posting and bonding of local roads
- Stormwater management — Act 537 regulations, maintenance agreements, best management practices, and an update on a draft ordinance
- Working with PennDOT — drainage, rights of way, and compliance with the Americans with Disabilities Act
- Working with developers — maintenance agreements and planned residential developments

The seminar runs from 9 a.m. to 3 p.m., with registration starting at 8:30 a.m. The registration fee is \$100 for Engineers Association members and \$150 for nonmembers and includes admittance to all sessions, plus handouts, continental breakfast, and lunch. To register, call PSATS at (717) 763-0930 or complete this form and send it, along with your registration fee, to PSATS at the address below.

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Greener Road Design (cont.)

These measures also help the environment and have the potential to save townships money by reducing the cost of road maintenance. Further discussion of these concepts, perhaps with the benefit of up-to-date engineering publications, can go a long way toward overcoming the older standards contained in existing, outdated codes.

For more information about the *Growing Greener: Conservation by Design* program, including subsidized technical assistance for municipalities, log onto the Natural Lands Trust Web site at www.natlands.org/growinggreener or call (610) 353-5587. ❖

* * *

About the author: Randall Arendt is senior conservation adviser for the Natural Lands Trust in Media, Pa., and an elected Fellow of the Royal Town Planning Institute. A town planner with more than 35 years of experience working with municipal engineers, he has designed subdivisions in more than 20 states and several Canadian provinces and has authored five books. To view his Web site, log onto www.greenerprospects.com.

Marcellus Shale

Summit will address natural gas issues

Township engineers will have the opportunity to identify and discuss water, infrastructure, legal, and business issues related to Marcellus Shale development in their communities at the Pennsylvania Natural Gas Summit, to be held **November 16-18, 2009**, at the Penn Stater in State College, Centre County. The theme is "Planning for Progress — Infrastructure and Water in the Marcellus Shale."

These discussions can help communities improve local decision making, guide local development of natural gas reserves, and improve the social and economic well-being of their residents.

Educational tracks include:

- Water use and wastewater treatment and disposal;
- Local economic opportunities;
- Issues for local governments and municipal officials;
- Legal issues in natural gas leasing and development;
- Natural gas pipelines and storage; and
- Federal and state regulations.

For more information about the Pennsylvania Natural Gas Summit, call toll-free (800) PSU-TODAY (778-8632) or log onto www.outreach.psu.edu and type "summit" in the search field.